



## HPC Series Brushless DC Motor Controller User Guide

Golden Motor HPC series motor controllers are specially designed for high power, high reliability brushless DC motor drive for electric vehicles, boats, and industrial applications. The controller is using the cutting edge technologies to deliver smooth and robust control experiences.

The controllers are manufactured with high quality components and materials for high end users. The casing is completely sealed to meet IP66 protection.

The optional programming kit (using PC USB port) is available for expert users to setup control parameters for their special applications.

### **Key Features:**

- ★ Suitable for brushless DC motors
- ★ Low noise, little torque fluctuation
- ★ Maximum efficient >98%, high reliability
- ★ IP66 Protection
- ★ 23-pin waterproof Connector
- ★ Regenerative Braking
- ★ Slope holding control
- ★ Cruise speed control
- ★ Over heat protection for both motor and controller
- ★ Programmable via USB of PC/Laptops
- ★ Programmable motor temperature limit
- ★ DSP control
- ★ Support CAN port (optional)
- ★ Dual controller synchronous drive





## ● Product Specifications

Model		Peak input current	Peak Output current(1min)	Voltage of Battery Pack	Cooling Condition
HPC300H Series	HPC300H48360	180A	360A	48V	External cooling
	HPC300H72300	150A	300A	72V	
	HPC300H96240	120A	240A	96V	
HPC500H Series	HPC500H48600	300A	600A	48V	External cooling
	HPC500H72500	250A	500A	72V	
	HPC500H96400	200A	400A	96V	
HPC700H Series	HPC700H48840	420A	840A	48V	
	HPC700H72700	350A	700A	72V	
	HPC700H96560	280A	560A	96V	

## ● Product functions

Item	HPC Series
Controller temperature protection	70~90° C: limit current output to prevent the controller from over-heat and damage. >90° C: controller will self-shutdown
Motor temperature protection	Programmable temperature limit. If the motor temperature hit the limit, controller will lower the output current to motor to prevent motor from over-heat or damage motor parts. (It works only when motor temperature sensor is presented)
Regenerative Braking (Energy feedback)	Transforming kinetic energy of vehicle into electricity to charge the battery when Brake is shorted to “GND” or <u>Brake</u> is “12V”, charging current and voltage are programmable via USB programmable interface.
Brake control	Stop motor drive, regenerative braking starts.
FWD/REV control	Control the motor rotation direction between forward and reverse
Cruise control	<p>Button switch: Depress the switch to start cruise speed mode Release the button to cancel cruise mode, or cruise control function is cancelled whenever brake is “ON” or “FWD/REV” switch changes.</p> <p>Note: If accelerator control speed is higher than cruise control speed, accelerator control is in effect. If accelerator control speed is lower than cruise control speed, accelerator control is not in</p>



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Slope holding control	effect. Optional: When parking or start on slope, the vehicle does not slip.
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## ● Alarm status output by USB or CAN

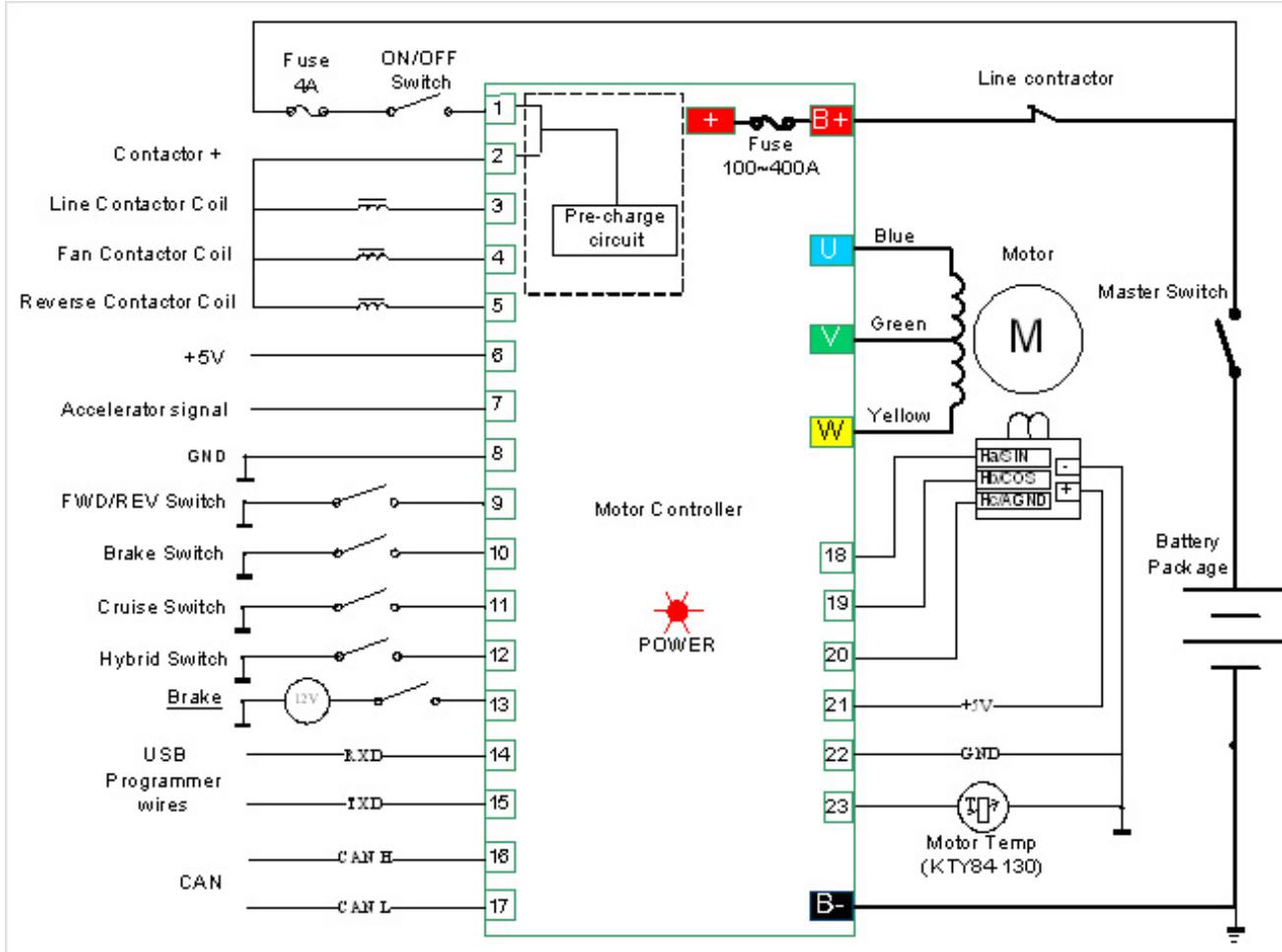
Alarm status display	Actions to rectify
High Voltage Shutdown	Check and reset parameter <Voltage High Shutdown> value setting, then restart controller
Low Voltage Shutdown	Check and reset <Voltage Low Shutdown> value setting, or charge battery pack
Voltage low limited speed to 50%	Check and reset <Voltage Low1> value setting, or charge battery pack.
Voltage low limited speed to 15%	Check and reset <Voltage Low2> value setting, or charge battery pack.
Controller shutdown at high temperature	Cooling controller or check heat sink, then restart controller.
Controller limits current output at high temperature of controller	Cooling controller or check heat sink.
Controller limits current output at high temperature of motor	Check and adjust <motor off(C)> value or cool the motor
Current Shutdown of DC Contactor1(PIN3)	Check Line contractor coil(PIN2, PIN3)
Current Shutdown of DC Contactor2(PIN4)	Check fan contractor coil(PIN2, PIN4)
Current Shutdown of DC Contactor3(PIN5)	Check reverse contractor coil(PIN2, PIN5)
Motor Hall Error	Check hall sensor wire of motor and connector or motor hall sensor
Phase Current Over Shutdown	Check phase wire of motor Check coil wire of motor Check controller output current
Stall of Motor Shutdown	Reset phase current value Check position sensor of motor Motor shaft is braked
Accelerator Output Voltage High Shutdown (PIN7)	Check accelerator GND(PIN8) wire, connector or accelerator



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## ● Wiring diagram

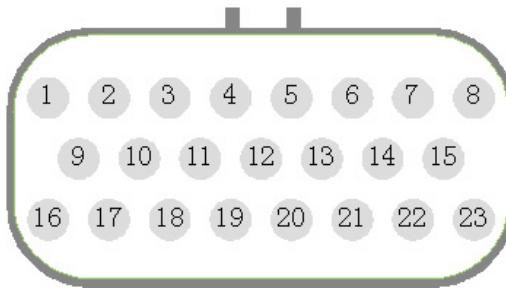
## HPC H Series Motor Controller Wiring Diagram





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## ● 23-PIN Connector Pin Numbering



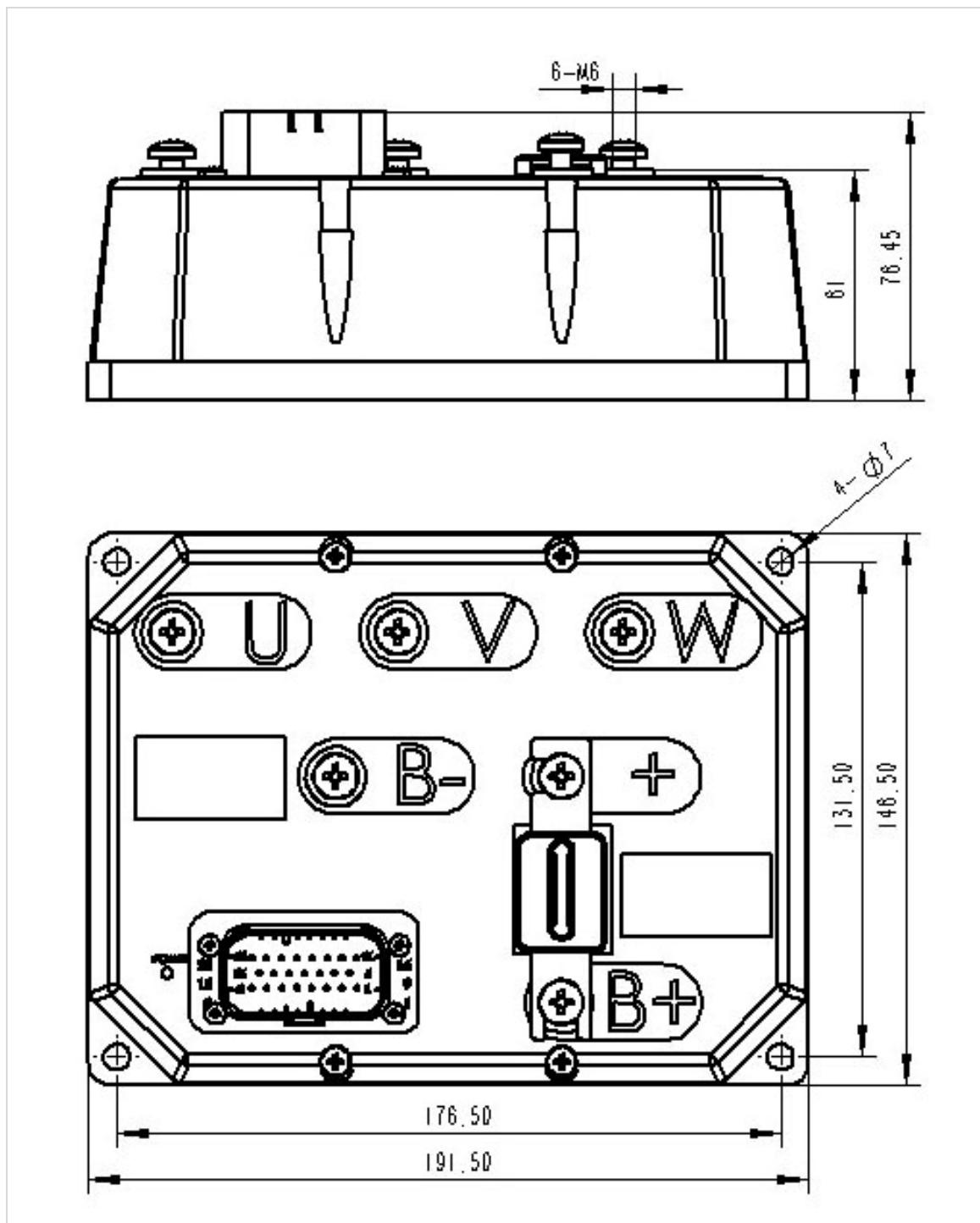
## ● PIN Connector Pin Definition and Description

Function	PIN	Symbol	Numerical value	Remarks
Power input	1	PWR	Batteries Voltage	Pre-charge
Contractor +	2	CON	Batteries Voltage	
Line contactor control	3	CON1	24~48V winding of line contactor	Ipeak <10A
Fan contactor control 2	4	CON2	24~48V winding of contactor	Ipeak <10A
Reserve contactor control 3	5	CON3	24~48V winding of contactor	Ipeak <10A
PWR	6	+5V PWR	+5V	Ipeak <1A
Accelerator Sensor	7	Acc	Accelerator signal	
GND	8	GND	GND	
FWD/REV	9	FWD/REV	“GND” FWD	
Brake	10	BAK	“GND” True	
Cruise control	11	Cruise control	“GND” True	Button switch
Hybrid control	12	Hybrid control	“GND” True	
<u>Brake</u>	13	<u>BAK</u>	“12V” True	0~15V Input
RXD	14	RXD	RXD	
TXD	15	TXD	TXD	
CAN H	16	CAN H	CAN H	
CAN L	17	CAN L	CAN L	
Motor sensor	18	Ha/SIN	Hall a/SIN	
Motor sensor	19	Hb/COS	Hall b/COS	
Motor sensor	20	Hc/AGND	Hall c/AGND	
PWR	21	+5V PWR	+5V	Ipeak <1A
GND	22	GND	GND	
Motor TEMP	23	Motor temperature	Motor TEMP	Silicon temperature sensors: KTY84-130



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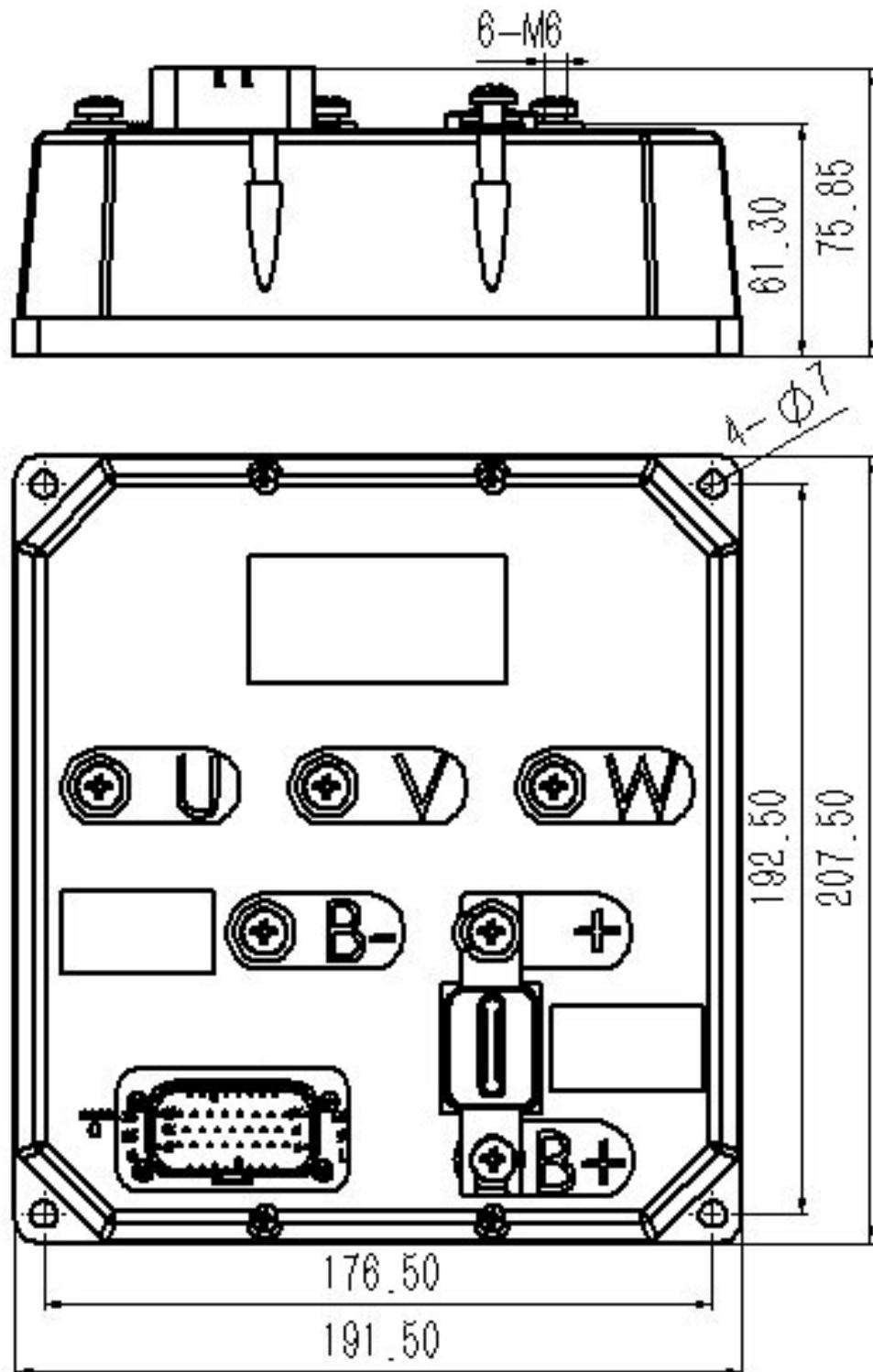
HPC300H series Motor Controller Dimensions (weight 2.2kg):





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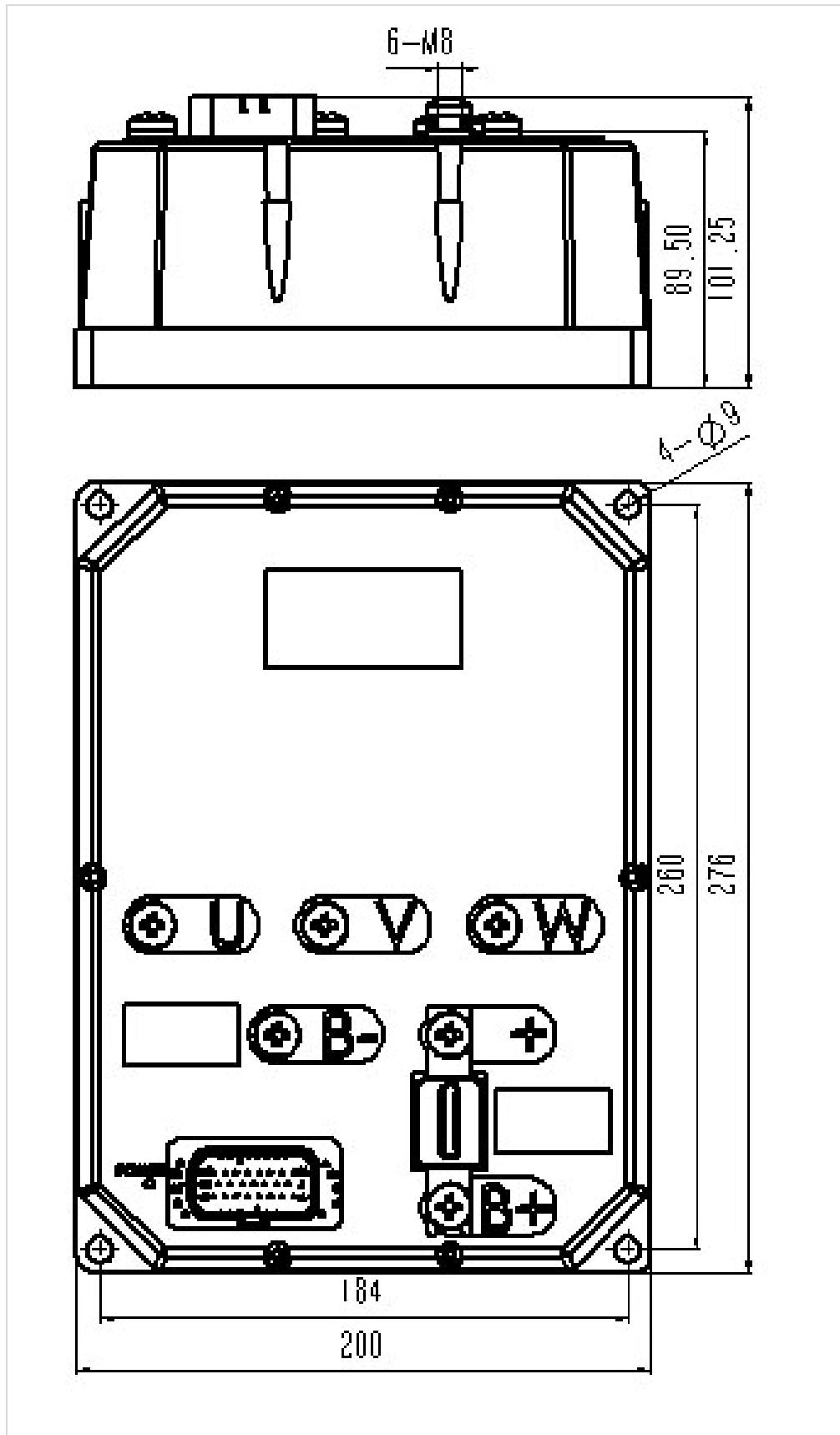
HPC500H series Motor Controller Dimensions (weight 2.9kg):





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HPC700H series Motor Controller Dimensions (weight 5.7kg):



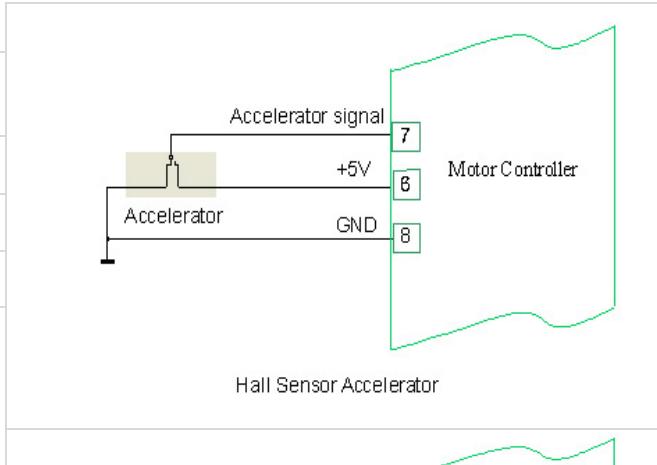


## ● Connect with accelerator

Accelerator output value can be with linear output or index output, use USB programmer software setup.

### 1. Connect with Hall Sensor Accelerator

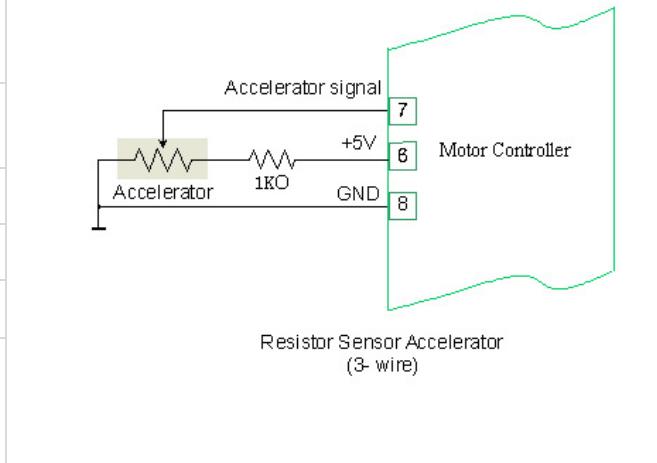
	Typical value	range
Initial value(mv)	800	650~1200
Final value(mv)	4500	2000~4500
Threshold(mv)	4900	4600~5000



### 2. Connect with 3-wire Resistor Sensor Accelerator

	Typical value	range
Initial value(mv)	100	50~1200
Final value(mv)	4100	2000~4100
Threshold(mv)	4500	4500~4900

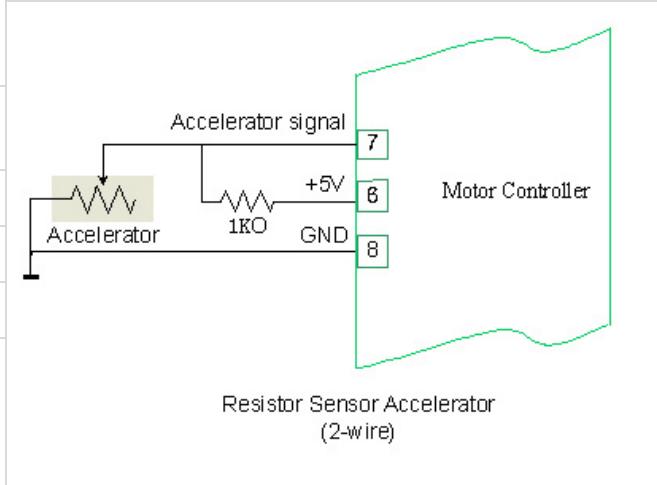
**Note:** External resistor (1K ohms) to prevent GND disconnect automatically run of the vehicle.



### 3. Connect with 2-wire Resistor Sensor Accelerator

	Typical value	range
Initial value(mv)	100	50~1200
Final value(mv)	4100	2000~4100
Threshold(mv)	4500	4500~4900

**Note:** External resistor (1K ohms) to prevent GND disconnect automatically run of the vehicle.



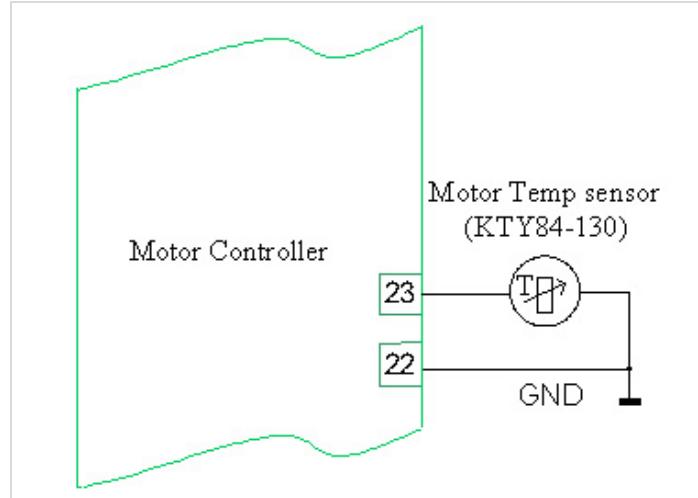


## Connect with motor temperature sensor

Motor temperature sensor

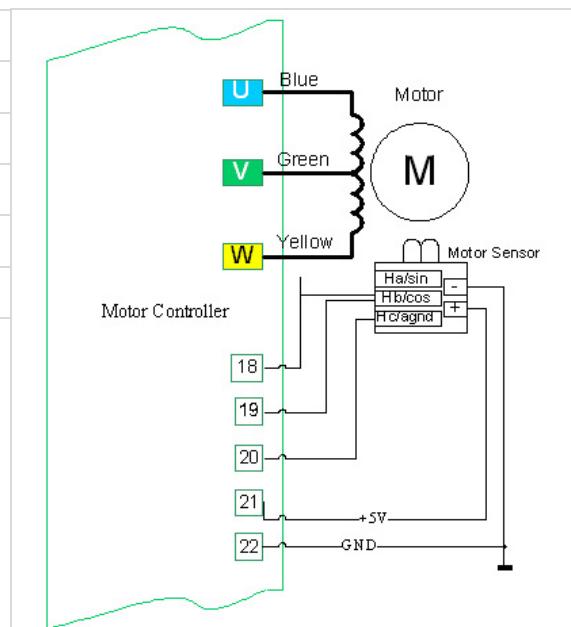
Type: KTY84-130

Range: -40~300°C



## ● Connect with motor hall position sensors

Controller	Motor	Motor Color
Pin 18	Hall a/sin	Blue
Pin 19	Hall b/cos	Green
Pin 20	Hall c/AGND	Yellow
Pin 21	+5V	Red
Pin 22	GND	Black



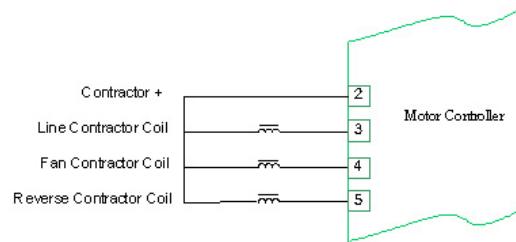
## ● Connect with contractor

contactor coil voltage	contactor coil voltage setup
36Vdc	24V or 36V
48Vdc	36 or 48V
72Vdc	48V



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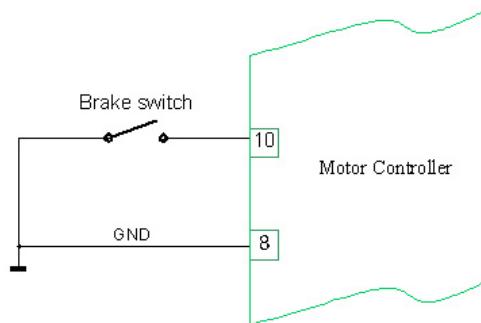
- When the Power On, Self Test is normal, about 600ms, after the controller start line contractor.
- When the controller temperature  $>30^{\circ}\text{C}$ , after the controller start Fan contractor.
- When the FWD/REV is REV, after the controller start Reverse contractor.



## ● **Connect with Brake or Brake**

### Brake:

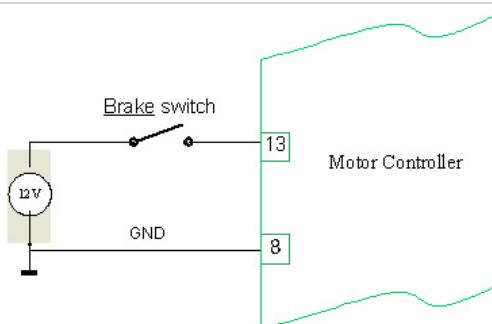
When the brake switch is closed, the motor feedback energy to the battery according with setup voltage and current.



### Brake:

When the brake switch is closed, the motor feedback energy to the battery according with setup voltage and current.

or



### Brake:

When the brake signal changes, the motor feedback energy to the battery according with setup current scaled changes.

